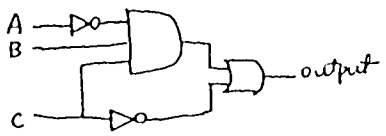
一) 下列那些 Boolean Algebra 函數可代表下圖 Logic 線路之輸出？5%

(a) $F=\bar{A}\cdot B+\bar{C}$ (b) $F=\overline{A\cdot C+\bar{B}\cdot C}$ (c) $F=\bar{B}\cdot\bar{C}+\bar{A}\cdot B+B\cdot\bar{C}$

(d) $F=A\cdot\bar{C}+\bar{A}\cdot B+\bar{A}\cdot\bar{B}\cdot\bar{C}$ (e) $F=\bar{A}\cdot B+B\cdot\bar{C}+\overline{B+C}$



二) 作微量分析時 樣品常受基質（matrix）之干擾而不能用外標準法定量。常用標準物增加法（spiking）來解決，今有一 Cu^{+2} 樣品用 spiking 法分析所得數據如下試求原樣品之 Cu^{+2} 濃度為若干？（$[Cu^{+2}]=0$ 時，儀器之 response 為 0

	原樣品	增加 0.10 ppm $[Cu^{+2}]$	增加 0.20 ppm $[Cu^{+2}]$
response	0.20	0.32	0.44

註：Spiking 又稱為 standard addition method.

三) 分析方法之可測極限量（method detection limit，MDL）可用來判斷分析數據正確與否之重要因素。如果定義 $MDL \geq t\cdot S_b\sqrt{\frac{N_1+N_b}{N_1\cdot N_b}}$（s＝標準偏差，N＝自由度，b 代表空白測試）如有一學生用 GC 測得一純淨土樣中含苯量（空白測試）分別為：0.2, -0.5, -0.2, 1.0, 0.8, -0.6, 0.4, 0.2, 0.3, -0.4 ng，試求在 99% confidence level 時 (a) 單獨分析 (b) 五次分析平均之 MDL 值應各為若干？8%

自由度	1	2	3	4	5	6	7	8	9	10	11	12	13
99% t值	63.7,	9.92,	5.84,	4.60,	4.03,	3.71,	3.50,	3.36,	3.25,	3.17,	3.11,	3.06,	3.01

四) 質譜儀之解析度（resolution）$R=\frac{\Delta M}{M}$ 為當相鄰兩個 Mass ion 只有 10% overlap 時之解析率，現有 Quadrupole 質譜儀解析度小於 700，試問能否辨別 CO, N_2 及 C_2H_4 三種化合物？5%

C＝12.00000000 H＝1.00782522 N＝14.00307440 O＝15.99491502

五) 根據 Benyon, Williams, 及 Lederberg 等人分別在 1963, 1964 年之報告，一般有機分子利用質譜儀分析所得之實驗式 $C_wH_xN_yO_z$ 可用來計算其所含的環及雙鍵數（三鍵相等於二個雙鍵數）：環數＋雙鍵數 $=\frac{2w-x+y+2}{2}$ 今有一化合物其分子式為 $C_{11}H_{10}$ 試問有幾種可能結構？7%

六) 毛析管柱層析法常用 splitless injection 法，試問為何須要使分析管柱的起始操作溫度低於 sample solvent 之沸點至少 15°C 以上？5%

七) GC 之 resolution 定義為 $R=\frac{1}{4}\sqrt{N}\left(\frac{\alpha-1}{\alpha+1}\right)\left(\frac{\overline{k'}}{1+\overline{k'}}\right)$ $\overline{k'}=\frac{k_1'+k_2'}{2}$ 今有一樣品經 GC 分析後所得數據如下：管柱長 $L=15$ m，$t_m=30$ 秒，$t_{R1}=96$ 秒，$t_{R2}=97.2$ 秒 $W_{R1}\simeq W_{R2}=0.7$ 秒 試求 (a) $N_{max}=?$ (b) $R=?$ 10%

八) 同上，如所有條件不改變，而 $R=20$，管柱之長度應為若干米？5%

註 t_m：non retented 化合物滯留時間

t_{R1}, t_{R2}：被分析物質之滯留時間

k_1', k_2'：被分析物質之 capacity factor

W_{R1}, W_{R2} 被分析物質 GC 圖譜 peak 基部寬度

N 理論板數

047

ENTRANCE EXAMINATION FOR THE GRADUATE SCHOOL
OF CHEMISTRY, CHENG KUNG UNIVERSITY

5% 1. The IR region extends from the red end of the visible region to the microwave region. The spectral range for mid-IR region covers the frequency range from _____ to _____ cm . IR involves the _____motions of the atoms in a molecule. There must be a change of _____ in order to absorb IR radiation.

An IR-detector that ultilizes (1) the expansion of a solid or fluid is a _____. (2) electrical resistance is a _____. (3) voltage induced at the junction of two dissimilar material is a _____.

The most frequently used IR-source is a Nernst Glower, which is constructed from a fused mixture of oxides of _____, _____, and _____.

6% 2. A conductance cell was filled with KCl solution that has a specific conductance of 0.0128 mho/cm. The measured resistance at 25°C was 48.3 ohms. (1) What is the cell factor K? When the same cell was filled with 0.100 N $CdCl_2$, a resistance 123.7 ohms was obtained. (2) What is the equivalent conductance of the $CdCl_2$solution?

6% 3. The equivalent conductance of a 0.0125 N acetic acid was determined at 25°C to be 14.4. Calculate both the degree of dissociation and the ionization constant. Provided the limiting equivalent conductance for hydronium ion is 349.8 and that of acetate ion is 40.9.

4% 4.Prepare a sketch showing the energetic levels and the orientation of the electrons for a ground singlet state, a ground doublet state, an excited singlet state and an excited triplet state.

5% 5.A reflective diffraction grating contained 1750 grooves/mm. The angle of incidence of a band of polychromatic radiation was 48.2°. Determine the wavelength that are diffracted at an angle of -11.2°.

6% 6.Draw a premix burner for atomic absorption and describe all the processes that occur in the burner.

8% 7.Why are the Stoke-Raman lines more intense than the anti-Stoke Raman lines?

6% 8.How to obtain a NMR-spectrum by using Pulse FT-NMR experiment?

6% 9.What are the chief interferences that exist in atomic absorption? How to aviod these interfernces?